

Models of Language Development

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MODELS OF LANGUAGE DEVELOPMENT

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OPEN UNIVERSITY PRESS
Milton Keynes · Philadelphia

Open University Press
Open University Educational Enterprises Limited
12 Cofferridge Close
Stony Stratford
Milton Keynes MK11 1BY

and
242 Cherry Street
Philadelphia, PA 19106, USA

First Published 1988

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British Library Cataloguing in Publication Data

Stevenson, Rosemary J.

Theoretical issues in language development.

1. Children. Language skills. Acquisition.

Psychological aspects

I. Title

401'.9

ISBN 0-335-09521-6

ISBN 0-335-09520-8 Pbk

Library of Congress Cataloging-in-Publication Data

Stevenson, Rosemary.

Theoretical issues in language development / Rosemary Stevenson.

p. cm.

Bibliography: p.

Includes index.

ISBN 0-335-09521-6 ISBN 0-335-09520-8 (pbk.)

✓ 1. Language acquisition. ✓ 2. Competence and performance (Linguistics) ✓ 3. Government-binding theory (Linguistics)

I. Title.

P118.S74 1988

401'.9—dc19 88-19659 CIP

Typeset by Colset Private Limited, Singapore
Printed in Great Britain by J.W. Arrowsmith Limited, Bristol

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Preface

I first thought I would write a book on language development in 1981. In that year, I presented a talk to the Developmental Section of the British Psychological Society in which I was critical of the current models of language development. After that talk, I felt dissatisfied. It is one thing to be critical but quite another to be constructive. This book represents my attempts to expunge those dissatisfactions and find a constructive solution to the problem of language development.

In 1983, I was lucky enough to spend a year in the United States, six months at the University of Massachusetts at Amherst, and six months at the University of Texas at Austin. While I was there I took the opportunity to sit in on some graduate courses in linguistics. I was very fortunate in both Amherst and Austin. At Amherst, the syntax class was taught by Edwin Williams and the semantics class by Barbara Partee. Both of them nurtured my interest in linguistics and introduced me to the intricacies of Chomsky's latest work.

At Austin, the syntax class was taught by Lee Baker and the semantics class by Irena Heim. Both consolidated my interest and my expertise in linguistics. I was particularly lucky here because Lee Baker's paper in *Linguistic Inquiry* in 1979 had been the first to spark my interest in the issue of learnability. I am very grateful for his support and encouragement while I was in Texas.

Needless to say, there are many people I should acknowledge. The

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CHAPTER 1

Language and Language Development

What is acquired?

An adult model of language use involves more than just a knowledge of language. It also involves aspects of general cognition or non-linguistic world knowledge, and aspects of social knowledge. We will start our discussion of language development by giving some examples of adult usage which will set the scene for looking at how children develop language. The view that I will take in this book is that adults bring to bear a number of different knowledge sources when using language and that these different knowledge sources can be regarded as distinct, even though they must interact in some way during language use.

For purposes of discussion, I will concentrate here on referring expressions (e.g. *the man*, *he*, *it*) and the kinds of problems they pose for language understanding. In particular I will consider pronouns because they provide an ideal example of the way in which language comprehension depends upon different sources of information, both linguistic and non-linguistic. I will briefly illustrate the way in which we can use four different knowledge sources to interpret pronouns. I will begin each of the following sections with a sentence that will be used to illustrate the use of these different knowledge sources.

Syntax

John said that Bill liked him.

In this example, in principle, if there were no grammar, then the pronoun *him* could refer to either John or Bill. However, this is not the case. There is a syntactic constraint on pronominal interpretation that rules out *Bill* as a permissible antecedent. Briefly, this constraint is that a non-reflexive pronoun, like *him*, cannot have an antecedent in the same clause. So that is an example of how syntactic knowledge can contribute to the comprehension of *him* in this sentence.

Semantics

A man came in. He was very wet.

In this example, the pronoun *he* is normally taken to refer to the man. However, there is nothing in the syntax of the sentence that could contribute to this interpretation. It is only by means of semantic knowledge – something akin to a model of the situation described by the two sentences – that the pronoun *he* can be assigned to the antecedent, *a man*. So this is where semantics can help. That is, on encountering the words *a man*, we can set up an entity to stand for the man in a discourse model. Then, on encountering the pronoun, this acts as an instruction to look for an entity in the model which agrees with the pronoun in number and gender. In this example, there is only one entity in the model (the man) so the pronoun can be assigned to that entity. This is only a very informal account of the semantics involved. More formal models have been developed in philosophy by Kamp (1984), in linguistics by Heim (1983), in artificial intelligence by Webber (1979) and in psychology by Johnson-Laird (1983) and by Stenning (1978).

Pragmatics (non-linguistic knowledge)

Jane was late for her appointment with Sue and she hurried to get a taxi.

In this example, neither syntax nor semantics can identify the antecedent of the pronoun *she*. The pronoun is contained in a separate clause from the one containing the two potential antecedents (*Jane* and *Sue*). This means that on syntactic grounds both potential antecedents are available. Similarly, a semantic analysis of the sentences will not help much either. The pronoun *she* is a particular number and gender, and

both number and gender are compatible with either of the two antecedents. So semantics cannot rule out either of the two potential antecedents for us. For example, let us assume that we have built up an internal discourse model of the events described in the sentence; more specifically, we have derived a representation of the first clause and are in the process of interpreting the second clause. Then if we interpret *she* as either Jane or Sue, both of those interpretations could be true in the discourse model that we have developed so far. So semantics cannot help us in this sentence.

However, there is a sense in which the sentence is not truly ambiguous. This is because we can make inferences from general knowledge about the likely consequences of someone being late for an appointment to infer that *she*, in fact, refers to Jane. Of course, we could interpret the pronoun as referring to Sue, but the resulting interpretation would describe a much less likely event. The inference that *she* refers to Jane is a plausible inference rather than a necessary one. That is what we mean by pragmatics.

Social knowledge

In considering social knowledge I will turn from pronouns to determiner phrases. Determiners are words like *a* and *the*, and they occur in determiner phrases, such as *a man* or *the man*. As Roger Brown pointed out in 1958, an individual can have many different names. For example, the four-legged noisy thing that shares my house with me can be called an animal, a dog, a spaniel, or Spot. How I refer to this creature will depend on what I assume the listener knows. If I assume that we share the knowledge of my dog, I will refer to her as *Spot*. But if I assume the listener does not know I have a dog, I will refer to her as *my dog*. It is my judgement of our shared knowledge which determines how I will refer to things. This shared knowledge is an example of social knowledge and in itself poses problems for development. (In fact, some readers may have been momentarily confused by my use of *her* to refer to the dog. This is an example of a pragmatic inference based on cultural assumptions.)

However, the examples I have given of some different features of language use do not really capture the full extent of our abilities when using language. For example, Bransford and his colleagues first showed how people frequently bring their background knowledge to bear on the comprehension of utterances. One example of this is the study by Johnson, Bransford and Solomon (1973). They presented adult subjects with short passages like the following.

The farmer must be warned of the oncoming flood the sheriff cried. He mounted as quickly as possible since he knew that it would take quite a while to spread all the news.

Following presentation of the passages, Johnson *et al.* presented the subjects with recognition sentences like *The sheriff mounted his horse as quickly as possible since he knew that it would take quite a while to spread all the news.* The subjects invariably said that they had heard the sentence before. Thus, they falsely recognized the sentence as the one that they had heard. What this implies is that people implicitly fill in the gaps in what they hear from their background store of knowledge. People automatically assume that the sheriff mounted a horse, even though this was not explicitly stated in the text. Notice that this really is knowledge of the world, in particular knowledge of a specific culture. In another culture, the equivalent of a sheriff might mount a camel or a donkey rather than a horse. Our use of non-linguistic or pragmatic knowledge, therefore, is very pervasive in our everyday discourses.

Similarly, our use of social knowledge is much richer than the perception of shared knowledge that I described above. For example, Schegloff (1968) has shown how skilled we are at turn taking in conversations and has indicated many of the subtle cues that we used in this respect. Similarly, Grice (1975) and more recently Clark (1979) have emphasized the social aspects of cooperation and politeness that are required for successful communication. In particular, they emphasize the ease with which people can interpret the intended meaning of an utterance rather than the literal meaning. Even young children seem quite good at this. When asked *Can you tell me your name?* children usually respond to the intended request for information and say their name. It might be reasonable to assume that they are shy if they respond to the literal question and simply answer *yes*.

These observations suggest that language use is so deeply embedded in other aspects of social and cultural knowledge that it must be impossible to study in isolation. But I think that this is not the case. We can easily find examples to show that the linguistic component can be distinguished from these other sources of knowledge. For example, Slobin (1966) presented adult subjects with a picture of a ball being kicked by a boy and then presented them with the sentence *The ball was kicked by the boy.* He then asked the subjects to say as quickly as possible whether or not the sentence was a true description of the picture. The subjects were very quick at making these decisions. By contrast, when the picture showed a boy being hit by a girl followed by

the sentence *The boy was hit by the girl*, the subjects were much slower at making the decision. One reason why the responses were so fast in the first case might be because the sentence can be understood purely by examining the major words. When we see the words *boy*, *kick* and *ball*, it is immediately obvious what action is being described. There is only one possibility. Thus the sentence can be interpreted purely on the basis of the major words and a consideration of possible events in the world.

On the other hand, this is not the case with the second sentence. If we look only at the major words, *boy*, *hit* and *girl* and consider the possible events in the world that could be described by those words, then two events are possible. Either the boy does the hitting or the girl does the hitting. It is only by examining the order of the words (the syntax of the sentence) that the second sentence can be understood.

Thus, there are at least some occasions when linguistic knowledge must be used for comprehension. However, Slobin's results also suggest how it might be possible to understand the first sentence without recourse to syntax. (This interpretation has been queried though, e.g. Forster and Olbrei 1973.) But it does seem likely that young children will do this when they do not understand the structure of a sentence that they hear. For example, Strohner and Nelson (1974) have suggested that young children of about two to three years use a 'probable event' strategy to comprehend difficult sentences. When these children do not understand the sentence, they take the key words and use them to interpret the sentence as describing the most probable event that could occur in the world, given that set of words.

However, it seems most likely that sentence *production* would not be possible without a knowledge of syntax. The order of words is crucial for conveying an intended meaning. For example, the sentence *John loves Mary* does not mean the same thing as *Mary loves John*. Although the words are the same in the two sentences, their order is different and it is the order that determines the meaning.

Another example of how we need to distinguish between linguistic and non-linguistic knowledge is taken from an argument of Slobin's (1979). Imagine a mother, a father and a small child playing with a ball in the garden. The father throws the ball to the mother and the mother turns to the child and says:

Daddy gave me the ball.

If children relied on non-linguistic knowledge, they could interpret the situation in some non-linguistic form, use that interpretation to work

out what the mother is saying and then how to say the same thing themselves.

Similarly, if children relied on social knowledge about giving and taking, and about agents and recipients, they could again interpret the situation from a social point of view and use that interpretation to work out what the mother was saying and then how to say it themselves.

Here are some of the difficulties. First of all, there are lots and lots of aspects of the environment that could be comprehended by the child and that could be encoded by the language. So the child has got to work out which features in the environment are, in fact, encoded by a particular sentence. Thus, for the cognitive and social knowledge to be sufficient, it is important that the child has interpreted the context in precisely the form above and not, for example, as *I took the ball from Daddy* or even just, *I've (mummy) got the ball*. So the child has got to make the interpretation that actually corresponds to the sentence. But there are all sorts of other distinctions in the environment that the child may notice. It might have started to rain, for example, so the child may have made an interpretation about the weather. It may be nearly tea-time, so the child may be thinking about his/her tea. The child may be more interested in getting the ball him/herself than in the fact that his/her mother has it. The possibilities are endless. So just homing in on the appropriate interpretation that matches the sentence is no trivial matter.

In fact, though, the situation is even more difficult than I have indicated. I have not, for example, even touched on the difficulties of how the child learns the syntax. In other words, even if the child does interpret the relevant situation, and so has a conceptual representation of it, just mapping the words that the mother says on to this representation will not solve the problem of learning the syntax.

In Slobin's example, it is the child who has just received the ball from his or her father and wishes to say:

Daddy gave me the ball.

As Slobin points out, the task looks straightforward. The child simply has to learn that the order of the words is actor-action-recipient-object. In addition, the child must realize that the object is either definite (*the*) or indefinite (*a*). But if we consider the variation between different languages, it soon becomes apparent that there is more to this problem than meets the eye. For example, in German, the determiners encode gender, number and case as well as definiteness. It would also be necessary in German to use a determiner for the agent of the sentence

which would indicate that the agent was definite, singular, masculine, and also the subject of the sentence. There are other differences between English and German but, more crucially, there are just as many differences between these two languages and other languages in the world.

What this means is that children must discover which of the large number of seemingly arbitrary facts about the world are actually encoded by the language that they hear. In our English example, it suddenly becomes apparent that a large number of possible distinctions are not required. Why do we only indicate that the object is definite and not the subject? Why indicate definiteness by a word that precedes the noun rather than one which follows it? And, as Slobin observes, why *not* indicate other facts that are also obvious – like the gender of the actor and the recipient, or that the action took place recently, or that balls are round, or that the action was witnessed by the speaker.

This is the major puzzle of language development. How do children learn to use the language that they hear in such a short space of time? The example that I have just given suggests that they cannot rely on cognitive or social knowledge alone. Somewhere along the line a knowledge of language itself will have to be learned. Attempts to solve that puzzle form the basis of this book. In fact, nearly every model of language development assumes that children have sentence–meaning pairs available to aid learning. It seems impossible to see how learning could develop without this assumption. The theories differ in how they assume that the syntax of the language is learned, given these sentence–meaning pairs. The second part of Slobin’s argument shows that this is not a simple matter. The first part shows that the assumption that children use sentence–meaning pairs still requires a precise explanation.

This distinction between linguistic and non-linguistic knowledge implies that we cannot consider language use without an understanding of how people use their knowledge of syntax in producing and understanding sentences. In fact, this discussion on the different components of language use is really concerned with linguistic performance. Performance is quite distinct from competence and so it is to that distinction that I now turn.

Competence and performance

Linguistic models of language are competence models. They describe the abstract system of rules that characterizes a person’s knowledge of language. It is this knowledge that enables people to have intuitions about

the grammaticality of sentences they have never heard before. A competence model, therefore, is designed to account for our ability to decide whether or not a sentence is grammatical. A competence model is not intended to account for the comprehension or production of sentences. For example, you may well be able to say that the following sentence is ungrammatical:

- (1) This is the girl who Mary liked Sue.

This decision reflects your linguistic competence. But you are also quite likely to hear a sentence like (1) being said by someone in a conversation. The Watergate tapes (Gold 1974), for example, are full of such speech 'errors'. This is because production is subject to performance factors such as limits on memory, choosing a particular linguistic structure to express an idea, and the need to produce the sentence in a certain left to right sequence. Similarly, comprehension reflects performance factors over and above our knowledge of language. Although we know, for example, that sentence (1) is ungrammatical, in an appropriate context we may still understand what is being said. We have cognitive skills other than language that enable us to decipher the meaning of a message. This distinction between competence and performance – between judgements of grammaticality and comprehension or production – is an important one when we consider the development of language.

Studies of syntactic development aim to account for how children move from their early one-word utterances to full adult knowledge. That is, they aim to explain the course of development from children's performance to adult competence. We should be wary, though, of finding a direct link between these two. Children's performance is manifest in comprehension and production, adult competence is manifest in grammaticality judgements. Thus, the evidence from children is evidence about performance; and that is very different from the evidence used to test a competence model.

In fact, many researchers have tried to circumvent this problem by trying to relate children's competence to adult competence. That is, they have used the children's performance data – comprehension or production – to infer the nature of children's competence. For example, several researchers (e.g. Brown 1973a, Schlesinger 1977) have argued that a child's grammar is based on semantic categories such as agent, experiencer, patient, rather than on syntactic categories such as subject and object. The task has then been to explain how this semantically based grammar develops into a syntactically based one. Other

people (e.g. Kuczaj 1982) have suggested that a child's grammar is a simple left to right, 'surface structure' grammar, and the task here has been to explain how this surface structure grammar develops into a more complex grammar, for example a transformational grammar of the kind proposed by Chomsky (1965).

But these are attempts to infer the nature of a child's competence from data derived from performance and should be treated cautiously. It is not yet clear to us how adult performance relates to competence. We have no rules, if you like, for making the necessary inferences from performance to competence. For the moment, let us note that the way children comprehend and produce utterances may tell us more about the social context of those utterances than about the nature of the child's language.

When reviewing the work on syntactic development, we will keep in mind the question of whether we are discussing competence models or performance models. In particular, we need to keep in mind three distinct questions. One is how we can characterize a child's developing linguistic system. The second is how we can characterize the adult's linguistic system and the third is what the relationship is between the child's developing system and the end state of the adult.

Because we need to keep these questions in mind, I will frequently refer throughout the course of this book to work on adults as well as children. However, alongside these questions, we need to keep clear the distinction between competence and performance. More specifically, we need to consider how children move from producing and comprehending utterances of their language to being able to do not only that (as in a performance model) but also have intuitions about whether or not an utterance is grammatical (the product of a competence model).

The goals of a theory of language development

A complete theory of language development needs to consider not only linguistic knowledge – both competence and performance – but also all the different knowledge sources that contribute to language use. Indeed, many studies of language development seem to confuse these distinctions and draw conclusions about linguistic knowledge from data that primarily reflect the use of non-linguistic or pragmatic knowledge. For example, I have already observed that young children can interpret sentences that they do not understand, just by using a 'probable event'

strategy. This suggests that young children may use a variety of non-linguistic strategies to 'get by' before a knowledge of the language is fully developed – just as adults do when faced with communicating in a foreign country.

The aim of this book is to attempt to show two things: first, that the major puzzle of language development – the development of syntax – needs to be considered independently of non-linguistic aspects of language use. I hope to show that this tactic has produced some major breakthroughs in our understanding of such development in recent years. The second aim is to consider the ways in which non-linguistic knowledge – both cognitive and social – can contribute to an overall theory of language development.

Suggested readings

The book by Bransford (1979) on human cognition is a good introduction to the nature of adult skills, both linguistic and non-linguistic. Slobin's (1979) chapter on language acquisition in the second edition of his book *Psycholinguistics* is a rich source of ideas and information. To see how people have tried to relate cognitive development to language development, the book by Rice and Kemper (1984) on *Child Language and Cognition* gives a clear and accurate account. Similarly, Bruner's (1983) book on *Child's Talk* does the same from the social point of view. For a linguist's viewpoint on the problem of language acquisition, I recommend Baker's (1979) paper in the journal *Linguistic Inquiry*.

CHAPTER 2

Syntactic Development

We have seen that the meaning of a sentence depends not only on the meanings of the individual words but also on their order. In other words, we need to consider the syntax of sentences. So I will turn now to consider how syntax is acquired by young children.

We can begin by considering the views of Pinker (1979) on what needs to be accounted for in a theory of language development. Pinker has proposed that any plausible theory of language learning will have to account for the fact that all normal children succeed in learning a language; it will have to be consistent with our knowledge of what language is; and it will have to be consistent with the stages the child passes through in learning language. More specifically, Pinker proposes a number of conditions that need to be met by an adequate theory of language learning.

First, we have to account for the *fact* that language can be learned in the first place. This is the *learnability* condition. The ease with which language is learned can be contrasted with the relative difficulty of learning things such as chess, calculus and other complex cognitive skills. Second is the *equipotentiality* condition. A child must be capable of learning any grammar. There would be no point in specifying an innate grammar of English. Third is the *time* condition. Language should be learnable in a normal time period. It is usually assumed that it takes about three years for the basic components of language to be